What is claimed is:

1. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

forming a coil-pattern-defining mask on a first surface of a coil substrate, the mask defining channels therein arranged in a desired pattern of coil conductors of a first coil and being configured to receive an electrically conductive coil-forming material, the channels extending through a thickness dimension of the mask at a depth that is greater than a desired thickness of the coil conductors to be formed in the channels; and

adding an electrically conductive coil-forming material to the channels to form the coil conductors of the first coil.

2. The method of claim 1, wherein the channels extend through the thickness dimension of the mask to the surface of the substrate.

3. The method of claim 1, further comprising the step, after forming the coil conductors, of removing the mask.

4. The method of claim 1, wherein the mask is formed stereolithographically.

5. The method of claim 1, wherein the mask comprises a developed photoresist.

6. The method of claim 1, further comprising the step of forming a second coil on a second surface of the substrate opposite the first surface.

7. The method of claim 6, further comprising the step of electrically connecting the first and second coils together.

8. The method of claim 1, further comprising the step, before the mask-forming step, of forming a layer of an electrically conductive substance comprising an active metal, the layer having a thickness that is relatively small compared to the intended thickness of the coil conductors, on the first surface of the substrate.

9. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

in at least a first surface of a coil substrate, forming coil-pattern-defining grooves extending from the first surface into a thickness dimension of the coil substrate; and

adding an electrically conductive coil-forming material to the grooves so as to form conductors of the coil.

10. The method of claim 9, wherein the coil-forming material is added to the grooves so as to fill the grooves completely.

11. The method of claim 10, wherein the coil-forming material extends above the first surface of the substrate.

12. The method of claim 11, further comprising the step, after the step of adding coil-forming material to the grooves, of removing coil-forming material extending above the first surface of the substrate.

13. The method of claim 9, further comprising the step of forming a second coil on a second surface of the substrate opposite the first surface, wherein the first and second coils are aligned with each other using a reference feature on the substrate.

14. The method of claim 9, wherein the grooves have a depth, in a thickness dimension of the substrate, greater than a desired thickness of the coil conductors to be formed in the grooves.

15. The method of claim 9, wherein the grooves are formed by machining the respective surface of the substrate.

16. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

on a first surface of an electrically insulative substrate, forming a first layer of an electrically conductive material;

patterning the first layer to define a coil pattern in the first layer;

applying a layer of a resist, at a thickness of at least 0.1 mm, to the first layer;

patterning the layer of resist with a coil-defining pattern aligned with the coil pattern in the first layer;

removing resist in regions where coil elements are to be located so as to expose the coil pattern in the first layer;

using the coil pattern in the first layer as a plating electrode, causing coil-forming material to be deposited by electroplating on the first layer, to form coils having side-walls defined by edges of the resist; and

removing the resist.

17. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

on a first surface of an electrically insulative substrate, forming a layer of a metallic material;

applying to the layer of metallic material a layer of a resist at a thickness of at least 0.1 mm;

stereolithographically patterning the resist with a coil-defining pattern;

removing undeveloped resist in regions on the first surface where coil elements are to be located, thereby producing exposed regions of the layer of metallic material where coil elements are to be located;

in the exposed regions electroplating a coil-forming metal from the exposed surface of the layer of metallic material, using the layer of metallic material as a plating electrode; and

removing the resist.

18. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

on a first surface of an electrically insulative substrate, forming a conductive metal sheet having a desired coil thickness;

on the metal sheet, applying a mask to regions where coil elements are to be located, thereby leaving unmasked regions of the metal sheet where coil elements are not to be located; and

removing metal of the metal sheet in the unmasked regions.

19. The method of claim 18, wherein the metal is removed by high-pressure spray etching.

20. The method of claim 18, wherein the metal is removed by sandblasting.

21. A method for manufacturing a coil for use in a charged-particle-beam apparatus, comprising:

on a first surface of an electrically insulative substrate, forming a conductive metal sheet having a desired coil thickness; and

from regions of the metal sheet where coil elements are not to be located, removing material of the metal sheet using a micro end mill.

22. The method of claim 21, wherein the working by the micro end mill leaves behind the lower part of the metal sheet, after which the remaining lower part of the metal sheet is removed by etching.